

NORTH BOSQUE RIVER BRIDGE
Texas Historic Bridges Recording Project II
Spanning the North Bosque River at State Hwy. 6
Clairette vicinity
Erath County
Texas

HAER No. TX-83

HAER
TEX
72-CLAIN
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD

National Park Service
U.S. Department of the Interior
1849 C St. NW
Washington, DC 20240

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NORTH BOSQUE RIVER BRIDGE

HAER No. TX-83

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Location: Spanning the North Bosque River at State Highway 6, Clairette vicinity, Erath County, Texas.
UTM: west abutment, 14/583955/3544975
east abutment, 14/584298/3544975
USGS Quad: Clairette, Tex.
(7.5-minute series, 1961, photorevised 1979).

Dates of Construction: 1932-33.

Designer: Texas Highway Department: George G. Wickline state bridge engineer; Gibb Gilchrist, state highway engineer.

Fabricator: Cage Brothers, Bishop, Texas.

Present Owner: Texas Department of Transportation.

Present Use: Highway bridge.

Significance: The North Bosque River bridge is a fine example of the Texas Highway Department's development of standard bridge designs. The rise of state highway departments marks the decline of the entrepreneurial bridge designer and the coming of the automobile age.

Historian: Mark M. Brown, Ph.D., August 2000.

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INTRODUCTION

The contrasts between the North Bosque River and the Barton Creek Suspension bridges in Erath County, Texas, are dramatic and instructive.¹ Completed in 1933 by the Texas Highway Department, the 1,105'-long, reinforced-concrete and steel girder North Bosque River Bridge was part of a \$63,270.10 project providing for the growing number of automobiles and an additional link in a statewide highway system. The 100' clear span, wrought-iron pipe and steel wire Barton Creek Suspension Bridge, on the other hand, was commissioned in 1890 by the Erath Commissioners' Court for \$1,400 from a commercial bridge company that employed largely untried, albeit patented, technology in the age of wagons and buggies. The North Bosque River Bridge is an example of changing bridge designs and methods of construction that occurred in Texas during the intervening forty-three years.

Just outside of the community of Clairette, State Highway 6 crosses and diverges from the watercourse of the North Bosque River, and turns towards Dublin, Texas. This particular stretch of Highway 6 connects Meridian, seat of Bosque County, with Dublin, Erath County, and De Leon, Comanche County; these towns are important regional trading centers. Highway 6 also connects Galveston on the coast with the western Red River Valley of Oklahoma.²

CONSTRUCTION HISTORY

In 1932, the Texas Highway Department advertised for bids on a project encompassing a 255'-6" bridge across Green Creek, the North Bosque River Bridge, and a culvert on State Highway 67, now Highway 6. Meanwhile, the department's Bridge Engineer estimated the total project cost for the three structures plus a ten percent contingency at \$73,923.35. The next day, 21 June 1932, in an action that would foreshadow trouble continuing long after the completion of the project, the engineer in charge of right-of-way asked the Division Engineer in Fort Worth whether all the required rights-of-way had been secured. It was with faith that the right-of-way issues were almost, or soon to be, resolved that the department opened sealed bids from seventeen contractors on 30 June. All but two of the contractors, who had bid \$72,260.55 and \$83,051.03, were under the estimate. Indeed, the lowest bidder, Cage Brothers of Bishop, Texas, came in at \$61,823.35. Cage Brothers officially received the contract on 29 July, and began construction on 22 August 1932. All

¹ Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior. "Barton Creek Suspension Bridge." No. TX-87.

² Patricia L. Duncan, "Meridian, Texas," *The New Handbook of Texas*, vol. 4 (Austin, Tex.: The Texas State Historical Association, 1996), 633-34; Duncan, "Clairette, Texas," *New Handbook of Texas*, 2: 128; William R. Hunt, "Dublin, Texas," *New Handbook of Texas*, 2: 711.

but site cleanup was finished on the North Bosque River Bridge component by the first week of April 1933.³

As with any project of this scale and complexity, there were a few minor difficulties. A subcontractor's drawings for the bearing plates did not follow specifications, and was required to conform. Certain (unspecified) aspects of the design were new, and in the rush to complete the drawings, a Highway Department engineer overlooked a reinforcing bar detail that speeded construction. Cage Brothers took a loss on excavations for the Green Creek Bridge, but successfully argued that it be exempted from the exact concrete finish specifications for the underside of both bridges. There were also several design changes, including revised bent heights for the North Bosque River Bridge. Almost a month after formal acceptance of the entire project, the contractor's bonding company went bankrupt and the Highway Department required Cage Brothers either to show evidence that they paid their bills or to post a new bond.⁴

While many construction projects during the 1930s were part of federal work relief efforts, the North Bosque River Bridge and related structures were strictly state projects. The Highway Department did require Erath County to acquire the right-of-way, to fence the alignment, and to pay one-third of the final construction costs when funds became available. The Commissioners' Court apparently made a good faith effort to acquire the land, but was put off by the high prices demanded by some property owners. In reporting on this situation to headquarters, the Division Engineer in Fort Worth also noted that Erath County had spent much money buying land for other state highways that had not yet been started. In essence, the Commissioners, while short on funds, were also holding out for more construction in their county. As a consequence, the completed bridges stood unused at least as late as September 1933.⁵

³ "Letter Authorizing Advertisement for Bids," 20 June 1932; G. G. Wickline, "Project Agreement Estimate," 20 June 1932; D. M. Neer to John Mead, 21 June 1932; memo to Gibb Gilchrist from G. G. Wickline, 30 June 1932; M.C. Welborn, "Construction Inspection Report," 7 Apr. 1933; all in Project Correspondence (Erath Project No. SAP 983-G, Control No. 258-2-2), Microfilm Index No. 3803, (Records Management Division, Texas Department of Transportation, Austin, Tex.), hereinafter cited as *Project Correspondence*.

⁴ G. G. Wickline to I. B. Orter, Alamo Iron Works, 2 Sept. 1932; G. G. Wickline to W. L. Marek, 7 Nov. 1932; G. G. Wickline to Gibb Gilchrist, 6 Jan. 1933; Gilstrap, Cage Brothers, to M.C. Welborn, 27 Apr. 1933; G. G. Wickline to M. C. Welborn, 1 May 1933; M. C. Welborn to Gibb Gilchrist, 19 June 1933; R. J. Hank to Cage Brothers, 13 May 1933, all in *Project Correspondence*.

⁵ T. H. Webb to Wallace Scott, Erath County Judge, 8 July 1932; M.C. Welborn to Gibb Gilchrist, 18 Sept. 1933; in *Project Correspondence*.

DESCRIPTION⁶

When the contractors and the inspectors finished their work, the North Bosque River Bridge consisted of twenty-six reinforced concrete girder spans 36'-6" and three 52'-0" steel girder spans supporting a 22'-0"-wide roadway along its 1,105' length. Highway Department engineers accomplished the design with a limited number of repeated components: abutments, two types of concrete bents, concrete girder spans, steel girder spans, and railings rated overall for two 15-ton trucks per span. Almost all of the concrete work was monolithic casting. Two four-column abutments with an overall width of 36', designed for heights of 18' to 35', were placed so that in profile they appear as high-legged chairs. The interior bents for the concrete spans were of a closed top "H"-shape with a maximum width of 25' and designed for 14' to 40' heights. Bents for the steel girder spans were of the same shape as their counterparts, but 23' wide and of a fixed 36' height. Five 1'-1" wide by 2'-1" deep concrete girders spaced about 4'-6" apart supported the 7-1/2" thick deck. The decks included 12" curbs and diaphragm crossbeams at the ends above the bents. Highway Department engineers deployed four 51'-10" Carnegie Beams, U.S. Steel's variant of the wide flange beam, 36" deep and weighing 135 pounds per linear foot over the main channel. Two sets of 15" channels placed 17' from the ends of the spans were riveted to the "I"-beams as lateral bracing. These main channel spans received a 8-1/4" concrete deck. Partially precast "Type K," low-height railings provided sturdy crash resistance while accommodating overhanging agricultural implements and trucks. Practically all edges, especially those visible to the public, received plain forty-five-degree chamfers. The design makes little, if any, use of historically derived decoration – a stark contrast to most reinforced-concrete bridges of the 1910s.⁷

NORTH BOSQUE, THE TEXAS HIGHWAY DEPARTMENT, AND THE AUTOMOBILE AGE

The North Bosque River Bridge and the Texas Highway Department heralded the arrival of the Automobile Age in twentieth-century America. Whether it was 1890 or 1933, Texans wanted out of the mud that hindered their growing desire for mobility. On the other hand, there were the enduring problems of finance and control. Local control of road and bridge construction meant swift awarding of contracts, a minimum of paperwork, and innovation driven by commercial competition. But in most rural Texas counties such as

⁶ All description and dimensions based on Texas State Highway Department, "Plans for Proposed Green Creek & Bosque River Bridges, Highway No. 67, Erath County, State Project No. 983-G" (Records Management Division, Texas Department of Transportation, Austin, Tex.).

⁷ These dimensions and the associated design ratios are very similar to those used in Indiana during the same period, and reflect both states' dependence on the standards of the federal Bureau of Public Roads. See James L. Cooper, *Artistry and Ingenuity in Artificial Stone: Indiana's Concrete Bridges, 1900-1942*, (n.p.: privately printed, 1997), 150-52, 6-30.

Erath, scant local resources limited the extent of transportation systems, and a lack of technical expertise exposed them to unscrupulous engineering for the sake of profit. The opportunities for a larger, higher capacity transportation system possible with state or federal funding would almost certainly come at the cost of local control and market-driven innovation and competition. Whereas citizens and county officials had extensive experience with horse-drawn carriages and wagons, providing for automobiles was another matter. Increasing weight and speed of automobiles and, especially, trucks was problematic. Right angle approaches, single lanes, and low or unknown load capacities common to rural bridges, such as at Barton Creek, became increasingly incompatible with motor vehicles and American drivers.⁸

Compared to the length of time people have exploited animal power for transportation, the transition to self-propelled vehicles was swift. It was also complicated, requiring changes in social and economic arrangements as well as technical innovation. The Federal Office of Road Inquiry, later the Federal Highway Administration, was established in 1893 to provide expertise and advice to state and local governments.⁹ Two additional pieces of legislation secured federal influence and control over bridge and highway construction. In 1916, and with an amendment in 1921, Congress made federal matching funds available through state highway departments. Most states that did not have a highway department, including Texas, acted swiftly. Additional provisions addressed project eligibility, maintenance, state appropriations, and reimbursement procedures.¹⁰ The social side of transition difficulties in Texas can be readily demonstrated by the fact that public debate over funding by gasoline taxes, by bond issues, or by a mix of bonds and taxes, lasted until 1933.¹¹

Federal funding was one of many factors that drew the new state highway departments to develop the uniform bridge standards that are so prominent at North Bosque. Other factors included the scale of operations, a significant factor in Texas; the susceptibility of funding sources to political and economic disruption; the high costs of research; public accountability for bridge failures; and the academic training shared by civil engineers.

Under bridge engineer George G. Wickline, the Texas Highway Department moved quickly to develop standard bridge designs and detailed procurement and construction procedures. The designs sought to balance safety, ease and speed of construction, and costs while also accommodating a wide range of site conditions. Even though North Bosque was not a federally funded project, its pre-engineered components had to meet nationally

⁸ Cooper, *Artistry and Ingenuity*, 110, 112, 122-23, 131-34.

⁹ American Public Works Association, *History of Public Works in the United States: 1776-1976*, ed., Ellis L. Armstrong (Chicago: American Public Works Association, 1976), 115; Cooper, *Artistry and Ingenuity*, 87-8.

¹⁰ "The First 50 Years," *Texas Highways* 14 (Sept. 1967): 16-17; American Public Works Association, *History of Public Works*, 77-82, 115; Cooper, *Artistry and Ingenuity*, 113-14.

¹¹ Kirk Kite, "A History of the Texas State Department of Highways and Public Transportation, 1917-1980" (Ph.D. diss., University of New Mexico, 1981), 49, 57-68.

recognized standards if they were to be used for federal projects. The system of standardized plans, meticulous specifications, and rigorous inspection was carefully orchestrated to produce a cadre of highly competitive construction companies.¹² At North Bosque, fifteen companies' bids were under the project estimate.

The predictability, accountability, conservative and redundant engineering, and understated visual image of the North Bosque River Bridge projected a uniformity that foreshadowed the nationally franchised hotels and restaurants that dominated the American highway landscape after World War II.¹³ The rise of the automobile culture and its prophets, the state and federal highway departments, shifted the competition from design innovation in the nineteenth century to execution and management in the twentieth. In the end, the North Bosque River Bridge is not particularly different from many other bridges built by Texas or other states in the 1930s, and it is in this fact that its significance can be found.

¹² Cooper, *Artistry and Ingenuity*, 139. For brief biographies of George Wickline, see HAER, No. TX-47, "Sabine River Bridge," 1996, 8-9, and Joseph E. King, *A Historical Overview of Texas Transportation, Emphasizing Roads and Bridges*, Tms, p. 56-7, Environmental Division, Texas Department of Transportation, Austin, Tex.

¹³ Cooper, *Artistry and Ingenuity*, 157.

SOURCES CONSULTED

"The First 50 Years." *Texas Highways* 14 (Sept. 1967).

American Public Works Association. *History of Public Works in the United States. 1776-1976*. Ed., Ellis L. Armstrong. Chicago: American Public Works Association, 1976.

Cooper, James L. *Artistry and Ingenuity in Artificial Stone: Indiana's Concrete Bridges, 1900-1942*. n.p.: privately printed, 1997.

Duncan, Patricia L. "Meridian, Texas." In *The New Handbook of Texas*. Vol. 4 (Austin, Tex.: The Texas State Historical Association, 1996), 633-3.

_____. "Clairette, Texas." In *The New Handbook of Texas*. Vol. 2 (Austin, Tex.: The Texas State Historical Association, 1996), 128.

Hunt, William R. "Dublin, Texas." In *The New Handbook of Texas*. Vol. 2 (Austin, Tex.: The Texas State Historical Association, 1996), 711.

King, Joseph E. *A Historical Overview of Texas Transportation, Emphasizing Roads and Bridges*. TMs. Environmental Division, Texas Department of Transportation, Austin, Tex.

Kite, Kirk. "A History of the Texas State Department of Highways and Public Transportation, 1917-1980." Ph.D. diss., University of New Mexico, 1981.

Project Correspondence. Erath Project No. SAP 983-G, Control No. 258-2-2, Microfilm Index No. 3803. Records Management Division, Texas Department of Transportation, Austin, Tex.

Texas State Highway Department, "Plans for Proposed Green Creek & Bosque River Bridges, Highway No. 67, Erath County, State Project No. 983-G." Records Management Division, Texas Department of Transportation, Austin, Tex.

Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior. "Sabine River Bridge," HAER No. TX-47. Prints and Photographs Division, Library of Congress.

_____. "Barton Creek Suspension Bridge," HAER No. TX-87.